

MONTHLY WEATHER REVIEW,

DECEMBER, 1877.

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

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INTRODUCTION.

In compiling the present REVIEW the following data, received up to January 14th, have been made use of, viz: the regular tri-daily weather charts, containing the data of the simultaneous observations taken at one hundred and twenty-eight Signal Service stations and twelve Canadian stations; monthly journals and means from one hundred and thirty-four of the former, and means from thirteen of the latter; two hundred and thirty-eight monthly reports from Volunteer Observers; forty-two monthly reports from United States Army Post Surgeons; Marine Records; reliable newspaper extracts; special reports. The most noticeable features for the month are: the severe storms Nos. II and XV; the small number of high pressure areas; the high average temperatures for all the districts; the heavy rains accompanying storms Nos. II, XI and XV; few auroras; frequency of lunar halos during the middle of the month.

BAROMETRIC PRESSURE.

In General.—A comparison of the isobarometric curves on chart No. II with the average for December for a number of years, shows the following, viz: for the present month the pressure, as reduced to sea-level, has averaged slightly below that for a number of years along the Pacific coast, in Utah, at Key West, in the Upper Mississippi and Lower Missouri valleys, and at Breckenridge 0.11 of an inch. For the Upper Lake region, Ohio valley, Tennessee and West Gulf States, it varies from slightly below to slightly above. In the East Gulf and Atlantic States and Lower Lake region, it averages above—at Oswego and Burlington, about 0.11 of an inch.

The local barometric ranges for the month have been as follows: *Large*—Norfolk, 1.50 in.; Eastport, 1.47; Cape Henry, 1.45; Atlantic City, Cape May and Cape Lookout, 1.41; Wood's Holl, 1.40; Newport, 1.35; Boston and New London, 1.34; Barnegat, 1.33; Portland, Me., Thatcher's Island, Wilmington and Smithville, 1.30; and from New England to eastern Tennessee and northern portions of Alabama, Georgia and South Carolina, the range has exceeded 1.20. *Small*—Los Angeles, 0.61 in.; Visalia, Cal., 0.62; Santa Fe, 0.63; Pioche, Nev., 0.65; San Francisco, 0.66; Salt Lake City, 0.68; Key West, 0.70; Sacramento and Pike's Peak, 0.73; Cheyenne, 0.76; Denver, 0.79; Red Bluff, Cal., 0.80; Winnemucca, Nev., and Boise City, Idaho, 0.81; Jacksboro, Texas, 0.82; Fort Gibson and Toledo, 0.86; Shreveport, 0.88; Indianapolis and Chicago, 0.89.

Areas of High Pressure.—Of these six have been traced and are described. This number is smaller than is usual for the month of December, and to which fact can be partly attributed the high average temperatures in the different districts. Two, Nos. IV and V, crossed the country north of the Lakes, and were accompanied in New York and New England by severe, cold weather. Four took a southerly path, producing high northwesterly winds and gales as they advanced south and eastward from the Rocky Mountain region, and in the Gulf States "northers."

No. I.—At 7:35 a. m., Washington time, of the 1st, this high-pressure area, (described as No. VI in the November REVIEW,) covered the Southwest; barometer, 30.48 inches at Shreveport, and 0.41 inch above the normal at Indianola. Excepting the southern portions of Texas and Florida, and from California to the western part of Washington Territory, the minimum temperature had fallen below freezing the preceding night over the whole country, and below zero from southeastern Dakota to the Red River of the North valley. During the day clear weather generally prevailed over the country east of the Rocky Mountains, excepting light snows from the Ohio and Upper Mississippi valleys to the Lakes. A second high-pressure area advanced southeastward toward New York and New England, and united with it at night. Morning

of the 2nd the barometer was highest, 30.54 in., at Cairo, with the barometric ridge extending from Louisiana northeastward over the Middle States to northern New England. Brisk to high northerly winds were produced from the New Jersey to the North Carolina coasts during the day, but with generally clear weather. By morning of the 3rd the central highest pressure had moved to the North Carolina coast, 30.63 at Norfolk 0.48 in. above the normal at Kittyhawk, N. C., with continued cold and clear weather in the Middle and New England States, but rising temperature thence south and westward. During the 3rd and 4th it gradually disappeared off the North Carolina coast, in advance of storm No. II.

No. II.—During the 3rd it was observed along the Pacific coast, succeeding low pressure No. I. By morning of the 4th the barometer at Portland, Or., was reported as 30.55 and 0.42 above the normal. Moving south and eastward during the day, it reached from Arizona and New Mexico to eastern Washington Territory and Montana on the morning of the 5th—0.32 above the normal at Salt Lake City. Northerly gales extended southward on the 4th and 5th from Wyoming and Dakota to the West Gulf States; maximum velocities: Cheyenne, NW. 34, Pike's Peak, NE. 53, North Platte, NW. 72, Denver, N. 60, Dodge City, N. 44, Fort Sill, NW. 42, Omaha and Denison, NW. 36, Indianola, N. 46, and Galveston, NW. 43 miles per hour. At 7:35 a. m. of the 6th it was central in western Texas; highest 30.65 at Brownsville, with temperatures below freezing, except on the immediate coast. Morning of the 7th isobar 30.50 included the Gulf States, Tennessee, and the larger portion of the South Atlantic States. During the 7th, as low-pressure area No. III passed eastward, this high area moved westward, united with a second, and the following morning reached from southern Dakota to Louisiana and Mississippi. At 7:35 a. m. of the 9th the highest covered Tennessee, 30.51 at Knoxville, but 0.37 above the normal at Detroit and Cleveland. Brisk to high northerly winds were produced from the New Jersey to the North Carolina coasts: at Kittyhawk, N. 40, Cape May, NW. 36, and Sandy Hook, NW. 35. In advance of low pressure No. IV, it moved eastward, and later southward. It was central over South Carolina on the morning of the 10th, over the central Gulf States on the 11th, 12th and 13th, after which it lost its identity. It is quite probable that during the nights of the 7th and 10th its effect was increased by high-pressure areas, which advanced from the west or northwest and united with it, as shown by the barometric deviations from the normals.

No. III.—Apparently advanced southeastward over Montana and Dakota, during the 12th, towards New Mexico and Texas. On the morning of the 13th the highest reached from Dakota to northern Texas, and New Mexico—0.41 inches above normal at North Platte—with cold, clear weather. At 7:35 a. m., 14th, isobar 30.50 included the Ohio valley region, with very generally cold, clear weather in the districts east of the Rocky Mountains, excepting occasional light rains in southern Texas. In connection with storm No. VI, north to west gales were produced the 13th and 14th from the Lower Lakes to the Atlantic coast, as far south as North Carolina. Morning of the 15th the highest, 30.50, was central in the Carolinas. As low pressure No. VII progressed eastward, it moved southwestward over the East Gulf States by the following morning, and with diminished pressure. During the 16th, 17th, and 18th, it gradually disappeared in that district.

No. IV.—It first became perceptible on the afternoon of the 16th in Manitoba by a sudden rise in the barometer and winds shifting to cold northerly. It rapidly extended southeastward on the 17th, with cold northerly winds, N. E. 32 miles at Duluth, and generally clear weather. By the morning of the 18th it was central north of New York; highest barometer 30.73 at Kingston, Canada, and 0.60 above the normal at Burlington. In the St. Lawrence valley the temperature fell to about 10° Fah., and the isotherm 20° included Nova Scotia and the larger portion of New England and New York. Afternoon of the 18th the pressure rose 0.74 above the normal at Eastport. Brisk and high northerly winds accompanied its advance in the Lower Lake region, St. Lawrence valley and New England, and high northwest veering to northeast winds from New Jersey to North Carolina; maximum velocities, Oswego, N. 32, Quebec, NW. high, Eastport, N. 33, Thatcher's Island, NE. 36, Sandy Hook, NE. 33, Cape May, NE. 32, Cape Henry, NE. 34, and Kittyhawk, NE. 31 miles. Morning of the 19th isobar 30.50 reached from the Middle Atlantic coast to Nova Scotia. During the day it apparently progressed southwestward along the coast, but with decreased pressure, under the influence of a minor depression passing eastward north of the St. Lawrence valley.

No. V.—At midnight of the 19th the pressure was observed increasing at the stations along Lake Huron. Morning of the 20th it was central northeast of that Lake; highest 30.43 at Rockliffe, Canada. By midnight isobar 30.60 included the Ottawa and St. Lawrence valleys, and northern portion of New England. At 7:35 a. m., 21st, the barometer at Father Point, Canada, read 30.74, and the minimum temperature at 0°. Brisk to high northerly winds accompanied its advance in the St. Lawrence valley and New England in conjunction with low pressure No. X, and extended as northeasterly winds to the Middle Atlantic and North Carolina coasts. The barometer at Eastport was 0.70 in. above the normal afternoon of the 21st. During the night the temperature fell below zero in New Brunswick. The pressure continued highest over the St. Lawrence valley on the 22nd, 23rd and 24th, but decreased in advance of storms Nos. XII, XIII, and XIV.

No. VI.—During the 24th the pressure rose somewhat above the normal from Montana and Dakota to Utah and western Kansas. By morning of the 25th the highest was probably north of Dakota, and con-

tinued so during the 26th and 27th. A storm was crossing the Rocky Mountain region from California, and No. XII and XIII were in the Southern States. At 7:35 a. m. of the 28th the barometer was high and considerably above the normal from the St. Lawrence valley to Lake Superior, and from Dakota to Utah, Oregon and Washington Territory, but still highest in Manitoba, and increasing to 30.46 at Ft. Garry by midnight. As storm No. XV advanced northeastward, this high area moved southward. It was central over Dakota and Nebraska on the morning of the 30th, with temperatures below zero in Wyoming, Utah, and western Nebraska, and below freezing as far southward as the interior of Texas. The following morning isobar 30.30 included the country from Texas to southern Dakota, and at midnight the highest was central in Texas. During the 28th and 29th high northerly winds and gales extended southward from Nebraska and Kansas to the Texas coast as a severe "norther," and to Florida and Cuba by the 30th; Dodge City N. 36; North Platte, Ft. Gibson and Denison N. 28. At Indianola extraordinary low tide was produced.

Areas of Low Pressure.—Of these fifteen are described, all of which have been charted but the first. Broken lines indicate the probable paths of the centres of the disturbances. By means of the deviations of the barometric readings, as corrected for temperature and instrumental error, from the means for the month and the observation, (7:35 a. m., 4:35 p. m., or 11.00 p. m., Washington time,) these areas of low pressure can be traced across the elevated country between the Pacific coast and Mississippi valley. No. II, IX, XI, XII, XIII and XV were accompanied by heavy rains and occasional thunder-storms. The most severe were Nos. II and XV.

No. I.—During the 1st this low-pressure area appeared in Manitoba, and passed eastward to the north of the Lake region on the 2nd. The 3rd light snows fell in the St. Lawrence valley, but the centre of the depression was at some distance to the northward, and therefore not charted.

No. II.—This storm can be traced to the Pacific coast. On the 1st rain was occasionally reported from California to Washington Territory. On the 2nd and 3rd light rains and snow fell in Arizona, Utah and New Mexico, with brisk and occasionally high winds; on Pike's Peak, SW. 56, and at San Diego, N. 30, the 2nd. Morning of the 3rd it was central north of Santa Fe. By midnight the rain-area had extended to the Mississippi valley, with increasing southeasterly winds, but changing to snow in western Nebraska and Kansas, with high northwesterly winds. Its course, previously southeastward, during the day was northeastward toward the Upper Lakes. At Dodge City and North Platte, the barometer fell 0.40 of an inch below the normal. Thunder-storms occurred in Texas, Indian Territory and Kansas. During the 4th rainy weather extended to the Atlantic coast, with occasional thunder-storms in Illinois and Michigan; snow fell from Nebraska to Dakota and Manitoba; clearing weather was reported from Texas to southern Nebraska, with brisk and high west to north winds; the central pressure continued diminishing, falling 0.72 below the normal at La Crosse. The 5th occasional thunder-storms were reported from Kentucky, Tennessee and Florida. The centre passed into Canada, with a barometric trough extending southward to the Gulf, to the eastward of which rainy weather and southerly gales veering to westerly prevailed; to the westward, brisk and high west to north winds, with the rain turning into light snow as far south as Tennessee. High pressure rapidly succeeding it, a "norther" was produced along the Gulf coast, reaching Key West on the 6th. By morning of the 6th it was central over or north of the mouth of the St. Lawrence, with still lower central pressure, 29.07 at Farther Point. During the day it moved to Newfoundland, followed by northwesterly gales and cold, clearing weather, except frequent snows from the Lakes to northern New England. Cautionary Signals were ordered to be displayed in its advance on the 2nd at Indianola and Galveston; 3rd, at Mobile, New Orleans and Upper Lake stations; 4th, Lower Lake stations; 5th, along the entire Atlantic coast from Eastport to Key West, and at St. Marks. They were justified at all stations except St. Marks, Baltimore, Detroit, Port Huron, Alpena and Chicago. The following maximum wind velocities in miles per hour, with direction, show the dangerous character of the storm—Indianola, N. 46; Galveston, NW. 43; Key West, N. 30; Charleston, S. 34; Smithville, S. 50; Cape Lookout, S. 60; Cape Hatteras and Kittyhawk, S. 44; Sandy Hook, S. 36 and W. 48; Wood's Holl, SW. 55; Thatcher's Island, S. 40 and W. 36; Eastport, S. 39; Mt. Washington, NW. 96; Buffalo, W. 48; Cleveland, W. 35; Milwaukee, SW. 36; Duluth, NE. 40; Bismarck, NW. 48; Breckenridge, N. 36; Yankton, NW. 35; St. Louis, W. 36; Omaha and Denison, NW. 36 miles. Along the New England coast, and at Grand Haven and Galveston, steamers were forced to seek shelter. Warnings were also sent on the 4th for the Canadian stations on Georgian Bay, Lake Huron and Lake Erie; 5th, for those on Lake Erie, in the St. Lawrence valley, and along the coasts of New Brunswick and Nova Scotia; 6th, for Newfoundland.

No. III.—Although the centre of this disturbance moved eastward at some distance to the north of the Signal Service stations, yet it can be traced to the Pacific coast. During the 5th falling barometer, southerly winds and rainy weather prevailed in Washington Territory and Oregon, with the centre of the storm to the northward. On the 6th it approached Manitoba. The 7th light snows occasionally fell from north-eastern Dakota to the Lakes, with fresh and brisk southerly winds veering to westerly and northwest. During the 8th and 9th it disappeared over the Gulf of St. Lawrence, accompanied by light snows from the Lake region eastward. Not any signals were displayed during its progress. The following high winds

occurred on the 7th: Bismarck, NW. 36 miles: Milwaukee, SW. 27; Grand Haven, NW. 36; Sandusky, W. 28; Buffalo, SW., 32. 8th, Sandy Hook, W. 28; Thatcher's Island, W. 32.

No. IV.—Like the preceding this was first felt in Washington Territory and Oregon on the 8th, where rainy weather prevailed, with the pressure slightly below the normal. In the Northwest the barometer fell quite rapidly, and was lowest on the afternoon of the 9th in northeastern Dakota, with high southerly winds in the Upper Mississippi valley. Its progress was then eastward, and northeastward into Canada on the 10th. A barometric trough formed toward the New England coast. Frequent light snows fell in the Lake region and New England, with fresh to brisk southerly winds veering to westerly, except northeasterly in Maine, but it lost its identity as the following storm approached. Cautionary Signals were ordered on the 10th at Cape May, Sandy Hook, and along the New England coast, but not justified, except at Eastport, N. 28; Thatcher's Island, NW. 36.

No. V.—After the preceding had passed eastward, the pressure again began to diminish in Washington Territory and Oregon, with continued rain, on the 9th. Afternoon of the 10th it was central in Manitoba, with rain. By referring to the chart it will be seen that its movement was very rapid and southeastward to the coast of Maine during the 10th and 11th, thence northeastward. From southern New England to Lake Ontario light rains and fresh to brisk southerly, veering to westerly, winds accompanied it, but thence north and eastward snow and brisk to high easterly winds, backing to northerly and westerly. Cautionary signals were continued on the 11th along the New England coast, and warning sent for the Canadian stations midnight of the 10th.

No. VI.—During the night of the 9th the pressure nearly recovered the normal in Oregon after the last storm had progressed to the eastward, but with continued rain. On the following day it again diminished, falling 0.38 below the normal at Portland during the afternoon, with heavy rains. The 11th frequent light rains fell from Washington Territory, to northern California, and the pressure regained the normal. Falling barometer and warm southeasterly winds indicated its approach toward Dakota and Manitoba. At 7:35 a. m. of the 12th it was central in Manitoba. As it passed southeastward a barometric trough reached to Texas. Rainy weather prevailed in the southern half of Texas, with easterly to southerly winds. During the 13th the centre of the storm passed over Maine, with the central pressure diminishing, and the barometer falling 0.65 below the normal at Eastport. From the Ottawa and St. Lawrence valleys to New Brunswick easterly gales, backing to northerly and northwest, with heavy snow prevailed; but in Nova Scotia, the larger portion of New England, New York and the Lower Lakes, brisk and high southerly winds, veering to westerly and northwest, with generally light rains. In southern Texas rainy weather continued, with occasional thunderstorms. Morning of the 14th the barometer at Sydney, Cape Breton, read 29.09, and northwesterly gales, with cold, clear or clearing weather were reported from thence to N. Carolina. During the day it disappeared to the eastward. Cautionary signals were ordered to be displayed on the night of the 12th at the Lower Lake stations, and those along the New Jersey and New England coast; afternoon of the 13th along the North Carolina coast. Warnings were also sent night of the 12th for the Canadian stations on Lakes Erie and Ontario, and in the St. Lawrence valley, and the 13th for those in Nova Scotia and New Brunswick. All were fully justified. Maximum velocities—Alpena, NW. 30; Erie, NW. 38; Buffalo, SW. 36; Toronto, NW. 31; Oswego, NW. 32; Father Point, NE. 40; Eastport, NW. 50; Thatcher's Island, NW. 52; Boston, NW. 48; New York, NW. 43; Sandy Hook and Cape May, NW. 48; Kittyhawk, N. 54; Cape Hatteras, NE. 34; and Mt. Washington, NW. 120 miles.

No. VII.—After high pressure area No. III had passed eastward from the Rocky Mountain region, the barometer fell below the normal along the Pacific coast on the 12th and 13th, and in northern Dakota and Manitoba, with brisk southerly to westerly winds, night of the 13th. Rainy weather was reported from Washington Territory the 14th; the barometer at Pembina 0.49 below the normal in the afternoon, with the centre of the disturbance probably in Manitoba; and high southerly winds in western Kansas and Nebraska. During the 15th it moved to the St. Lawrence valley quite rapidly; lowest barometer 29.36 at Quebec, with southerly winds veering to westerly and increasing to brisk and occasionally to high along the Middle Atlantic and New England coasts; light rains were occasionally reported from the Ohio valley and New Jersey to the Lower Lakes, New England and St. Lawrence valley, partly turning into snow in last district. The 16th it disappeared eastward over the Gulf of St. Lawrence. Signals were displayed night of the 15th along the New Jersey and New England coasts, only a portion of which were justified. Maximum velocities—Cape May, SW. 28 (late;); Sandy Hook, SW. 32 (late;); Eastport, NW. 30; and Mt. Washington, NW. 108 miles.

No. VIII.—At midnight of the 16th a disturbance apparently central north of Lake Superior. During the 17th it rapidly passed over the St. Lawrence valley, Maine and Nova Scotia, accompanied by occasional light snow or rain; lowest barometer, 29.69 at Sydney; high pressure area No. IV rapidly followed it. The barometric gradient between the two became quite steep, resulting in frequent high northerly winds from the St. Lawrence valley to Nova Scotia and New England, which extended during the night southward along the coast to North Carolina, but with generally clear weather, except rain on the North Carolina

coast. Signals were ordered to be displayed, night of the 17th, along the New England and New Jersey coasts, and the 18th, as far south as Charleston. The majority were justified—Eastport, N. 32; Thatchers' Island, N.E., 36 (late); Sandy Hook, N.E., 33; Atlantic City, N.E. 32; Cape Hatteras, N.E. 28; Cape Henry, N.E., 34 (late); and Cape Lookout, N.E. 30 miles.

No. IX.—This storm can be traced to the Pacific coast. In California the barometer fell to about 0.30 below the normal the 14th, with rainy weather and increasing easterly winds in the southern portion, at Los Angeles, N.E., high. The 15th, the rain area extended eastward to southern Nevada and New Mexico, and frequent light rains fell in central and southern Texas, with a high S.W., wind on Pike's Peak. On the 16th occasional light rains were reported from Nevada, Utah, Wyoming, New Mexico, and from Texas to Kansas, Missouri, Illinois and the Ohio valley, with thunder storms in Kansas. At midnight a barometric trough extended from northwestern Texas to Lake Superior. It is quite probable that low pressure No. VIII was formed or separated from this by high pressure No. IV. At 7.35 a. m. of the 17th it was central in Kansas and Nebraska; during the day generally light rains fell from Texas to the Ohio. Upper Mississippi and Lower Missouri valleys, with thunder storms in Kansas, Nebraska, Iowa, Illinois, Missouri and Indian Ty.; its northward progress was due to the pressure being high and decidedly above the normal to the eastward, and below the normal thence westward to the Pacific coast. The 18th it passed northward into Canada; frequent rains were reported from Texas, Indian Ty., and from the Lower Missouri valley to the Lakes, with thunder storms in Kansas, Indian Ty., and at Key West. The Signals displayed at Milwaukee and Grand Haven were not justified. Although the track cannot be charted after the morning of the 18th, yet from a study of the tri-daily maps of this office there is little doubt but that this disturbance is the same as the following.

No. X.—On the 19th rainy weather extended from the Lakes to New England and the eastern British Provinces, partly turning into snow in the St. Lawrence valley; high winds were reported from Wood's Holl, W. 28, and from Father Point, S. 30. During the 20th high pressure No. V rapidly succeeded it, producing a steep gradient, and, in consequence, high winds at places. Signals were displayed night of the 20th along the North Carolina and New Jersey coasts. Maximum velocities—Cape Lookout, N.E. 36; Kittyhawk, N.E. 30; Barnegat, N.E. 29 (late); Boston, N.W. 36; Eastport, N. 29; Father Point, N. 36, and Halifax, N. 28.

No. XI.—During the 15th, after storm No. IX had left the Pacific coast on its eastward march, the pressure began diminishing in Oregon. The 16th rainy weather was reported from northern California to Washington Territory, with the barometer 0.43 below the normal at Portland. The 17th frequent rains continued in the Pacific States, with the central disturbance advancing toward southern California; at San Diego high S.E. wind. During the 18th clearing weather prevailed in the Pacific States; threatening and rainy weather in Arizona; frequent light rains and increasing southerly to easterly winds in Texas; S.E. 28 at Camp Stockton. The 19th the centre passed into Texas, with a barometric trough extending to Iowa; it was followed by clearing weather in Arizona and New Mexico, and accompanied by rain and occasional thunder-storms from Texas to Iowa and Nebraska. The 20th rainy weather prevailed from Texas and Louisiana to Nebraska, with high winds and gales at places, severe thunder-storms in Texas, and with lower pressure—0.38 below the normal at Galveston. During this same day a second disturbance passed eastward over Washington Territory and Oregon, producing light rains; 21st, it crossed Montana, with snow or rain thence to northern California, Oregon and Washington Territory. The pressure being below the normal at the Rocky Mountain stations and decidedly above in the Atlantic States, this storm took a northward course on the 21st, with threatening or rainy weather from the Gulf and South Atlantic States to Nebraska, but gradually clearing away in the Southwest—pressure 0.43 below the normal at Fort Gibson. During the 22nd the two apparently combined in the Missouri valley, with continued threatening and rainy weather and frequent high winds, mostly easterly or southerly, from the East Gulf and South Atlantic States to the Northwest and Lake region, except high northerly winds and occasional snow in the western portions of Nebraska and Kansas—lowest barometer, 29.60, at Omaha. The 23rd it apparently disappeared northward over Manitoba, with frequent rains from Minnesota to the Lakes. Cautionary Signals were displayed on the 19th at Indianola, Galveston and Key West; 20th, at New Orleans, Mobile and St. Marks; 21st, along the South Atlantic coast; 22nd, at Milwaukee and Grand Haven. For Key West, St. Marks, Milwaukee and Grand Haven they were not justified. Maximum velocities: Indianola, E. 28 (late) and N. 40 miles; New Orleans, S.E. 33 (late); Mobile, S.E. 28; Tybee Island, N.E. 36; Cape Lookout, N.E. 36; Duluth, N.E. 32; St. Paul, E. 35; St. Louis and Cairo, S.E. 25; Dodge City, N.W., 33; North Platte, S. and N.W. 28.

No. XII and XIII.—During the 22nd the winds shifted to easterly in southern Texas, with threatening weather and light rains, and a thunder storm at Indianola. By 7.35 a. m. of the 23rd the storm was central off the Texas coast, with brisk to high northerly winds. During the day threatening and rainy weather prevailed thence to the Ohio valley, Virginia and South Atlantic States; occasional thunder-storms in Texas, Louisiana and Alabama; and clearing away in Texas at night. The 24th rainy weather was reported from the East Gulf and South Atlantic States and Maryland to eastern Indian Territory, Missouri and the Upper Lake region, with thunder-storms from Florida and Alabama to southern Illinois. While at midnight it

was central in southeastern Missouri, and barometer 29.87 at Cairo, a barometric trough was traced to the southeastward toward Florida, with a tendency to form a secondary depression in that direction, and which latter, No. XIII, was completed and central off the South Carolina coast by the following midnight, as shown on the chart; barometer at Charleston 0.39 below normal. During the 25th threatening and rainy weather continued from the Upper Mississippi valley and Lake region to the South Atlantic States and Maryland, and clear or clearing weather in the Gulf States. The 26th No. XII gradually lost its identity, while No. XIII increased very much in severity but not in extent. By midnight the barometer at Kittyhawk fell to 29.47, and at Cape Hatteras 0.62 below the normal. Along the North Carolina and Virginia coasts, severe northeast backing to northwest gales and very heavy rains prevailed. Frequent rains also fell on the 26th from the South Atlantic States to Missouri and the Lake region. The 27th this storm disappeared northeastward into the Atlantic, followed by clearing weather. Signals were ordered on the 26th along the North Carolina, Virginia and New Jersey coasts, all of which were justified, except in northern New Jersey; maximum velocities: Cape Lookout, (late) E. 30; Cape Hatteras, NE. 58; Kittyhawk, NE. 60; Cape Henry, NE. 56, and Cape May, NE. 26.

No. XIV.—During the 24th and 25th the pressure diminished quite rapidly in Nova Scotia, with northerly winds and light snow. At midnight of the 25th the barometer at Sydney read 29.52, with easterly winds, and the centre of the storm to the south of that station. The 26th it disappeared to the northeastward. During the night of the 25th signals were ordered for Eastport, but not justified, and warnings sent for Halifax and Sydney, but too late to be of service.

No. XV.—This storm has been traced from the Pacific coast. On the 22d southeasterly winds, rainy weather and rapidly falling barometer were reported from Washington Territory and Oregon—0.33 below the normal at Portland by midnight. The 23rd, barometer 0.43 below the normal at San Francisco, and 0.32 at Salt Lake City; threatening weather and frequent rains prevailed from California to Washington Ty., with high southerly winds at San Diego, Mare Island and Red Bluff, Cal., and Pioche, Nevada. During the 24th clearing weather was reported from the Pacific States, and rain areas from Arizona, partly turning into snow thence to southern Nevada. The 25th a barometric trough was traced from Montana southward over Arizona, being probably lowest south of latter, with snow or rain from Nevada, Utah, Wyoming and Dakota to Arizona and New Mexico, high southeast winds at Santa Fe, and S. 40 miles on Pike's Peak. The 26th the trough moved eastward, with occasional light rains in western Texas, and light snows from Utah and Colorado to Dakota and Nebraska, and north east gale on Pike's Peak. The 27th the storm-centre advanced into southern Texas, accompanied by thunder-storms, with increasing southeast to northeast winds and rainy weather in Texas, Indian Ty. and Kansas, and with northerly winds and snow from Colorado and Wyoming to Minnesota, partly changing into rain towards the Upper Lake region. During the 28th it advanced to the coast of Alabama with increasing severity and diminishing central pressure; at Mobile barometer 29.43 and 0.77 below the normal; the rain-area extended to the East Gulf States and Tennessee, with thunder-storms in Florida at night and clearing weather in southern Texas, with high northerly winds. The 29th it developed into two distinct depressions, central in eastern and western North Carolina; the central pressure continued diminishing—29.34 at Wilmington, and 0.83 below the normal. The storm increased in extent and severity; the rain-area advanced to the South Atlantic States, Virginias, Ohio and Upper Mississippi valleys, with easterly to northerly winds and turning into snow from northern Texas to Dakota and western Minnesota, with frequent high northerly winds. A severe "norther" prevailed on the Texas coast, and extended eastward to Florida as high northwesterly winds. At 7:35 a. m. of the 30th the storm was central to the southwest of Norfolk, where the barometer fell to 29.16, and 1.01 below the normal. During this day the rainy weather extended north and eastward, generally changing to very light snows along the New England coast, and in the Lower Lake region, clearing but cloudy weather, with brisk to high northwesterly winds, succeeded it in the Southern States and Ohio valley. The 31st, heavy snow fell in Nova Scotia, with northerly gales, and at midnight the barometer fell to 28.99 at Sydney; high northwest and northerly gales, with very generally clear weather, prevailed from North Carolina to Maine, and with occasional light rains in southern Florida. In North Carolina and Virginia the rains were very heavy, producing destructive floods. Along the East Gulf and Atlantic coasts, especially from the Carolinas to Nova Scotia, this storm was unusually severe, resulting in much damage to shipping. Quite a number of cases have been reported where coastwise steamers were obliged to seek shelter or delay sailing. Cautionary Signals were ordered to be displayed the 27th at Indianola (late) and Galveston; 28th, from New Orleans to Key West, and thence to Norfolk; 29th, as far north as Wood's Holl; 30th, thence to Eastport. Warnings were also sent for the Canadian stations, St. Johns, Halifax, Sydney and those along Lakes Erie and Ontario, on the 29th. The following maximum velocities are given, from which it will be seen that this storm was the most severe of the month: Indianola, E. 28 and N. 43, Mobile, E. 33, Key West, S. 33 and W. 40, Cape Lookout, E. 65 and W. 48, Cape Hatteras, NE. 52, Cape Henry, NE. 74, Cape May, NE. and NW. 48, Barnegat, NE. 70, Thatcher's Island, NE. 48, Eastport, N. 36, Vicksburg, W. 36, Montgomery, W. 28, Knoxville, NE. 30, Washington, NE. 27 and Philadelphia, NE. 38 miles.